The Xtal Set Society Newsletter

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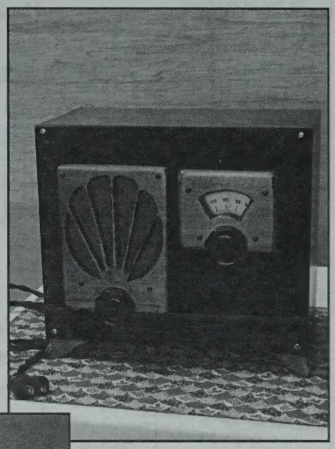
My Super heterodyne "All American Five"
By Anthony Dunn

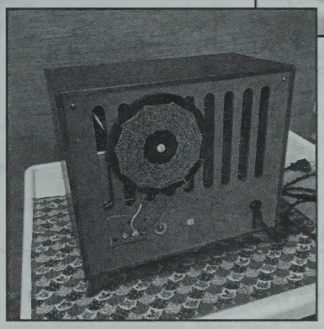
Recently I've been having fair success making simple tube radios, some with more modern tubes, and some with truly ancient #30, #31, #32, and their ilk. Thoroughly in love with the hobby by now, I decided to go "Whole-Hawg" and try to brew up a replica 1940's "All American Five".

I also enjoy small woodworking, so I also constructed a poplar wood cabinet, stained and finished with hand rubbed oil. A sheet of opaque black acrylic Plexiglas does duty for the original Bakelite front panel, which is unobtainable in the 21st century. The back is 1/8 inch Masonite cut out on a scroll saw. My dial plate is just a blank CD printed with the image of a dial, and mounted on one of the Xtal Set Society's little vernier drives.

The circuit begins with one I found on a website called "Fun With Tubes", and got modified to match what I wanted to build, and the parts I have available. The original was a 3 tube headphone radio, meant to be operated from a bench power supply. I wanted to drive a speaker, and so added a generic audio output stage, as well as an internal power supply.

This configuration just happens to be the classic, 5 tube, hot chassis, All American Five. Finding that the "12S" series of octal based tubes is still available

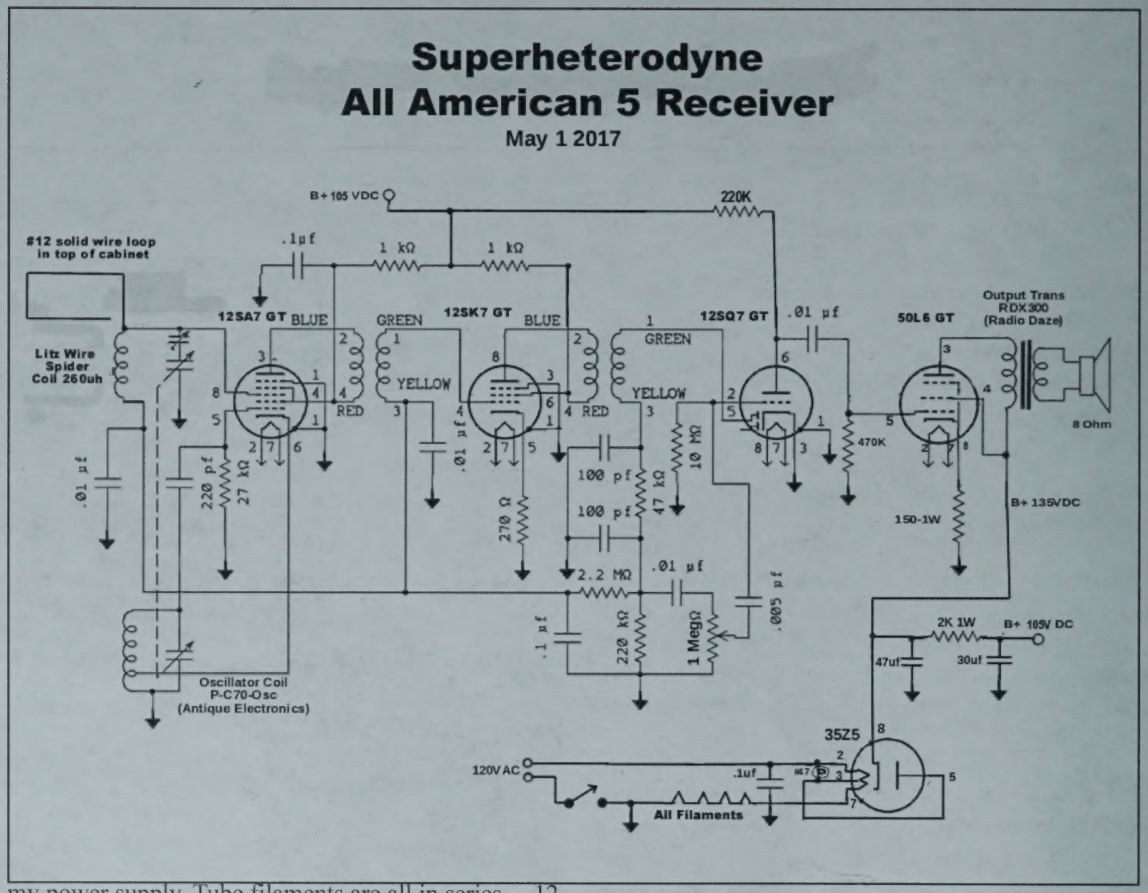




online, I settled on a date to replicate of 1941. Almost certainly, some folks listened to Franklin Roosevelt declare war, on just such a set!

I began with conventional "point-to-point" construction. A ganged variable capacitor meant for super heterodyne circuits, speaker, output transformer, and IF transformers were mounted above the chassis. I was lucky in my eBay bidding, and obtained a pair of IF "Cans" which came from the same antique radio, and were even still somewhat aligned with each other at 455kc, my intended intermediate frequency.

Most everything else is below the chassis, connected with vintage style cloth covered wire. Since it's a "hot-chassis" circuit, I included a 1 amp fuse in one leg of



my power supply. Tube filaments are all in series ---12 + 12 + 12 + 35 + 50 equals 121 volts, so I'm all set for a 120 VAC supply!

This circuit is pretty conventional for the times, and you can get a half dozen like it for just a few minutes with Google. I settled on this one because of its simplicity, since I'm very much "fighting out of my weight" trying a home brew super heterodyne.

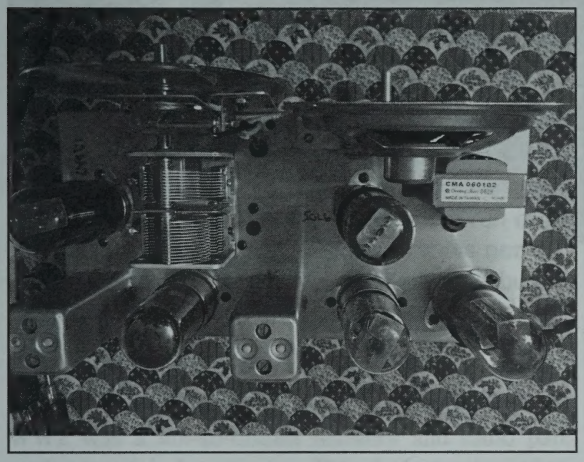
My main LC tank coil really should be an oblong spiral, glued to the inner surface of the radio's back. I couldn't get one, so with the aid of "Professor Coyle", I constructed a Litz wire "spider" coil, wound on a form made from the remainder of my black Plexiglas

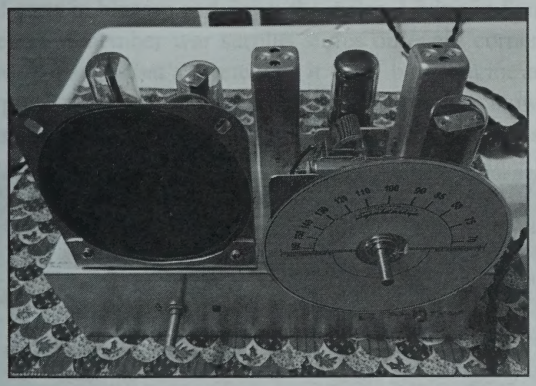
Now things get tricky. I could tell on initial power-up that the set had the potential to play, but in no way could I get it to "track". My main LC tank coil, ganged variable capacitor, and perhaps my oscillator coil just don't match each other. The solution was the addition of a 455pf -1200pf capacitor wired in SERIES with the variable cap of the main LC tank. I was able to alter the capacitance of my variable cap by adjusting this, and eventually to bring in all my favorite stations.

The last addition was a loop of #12 solid wire, epoxied into the top of the cabinet, and connected to the signal side of the variable capacitor. This increased the volume a lot. I suspect the physical size of my spider coil is insufficient by itself to bring in enough signal, since it's all the antenna this set has. Success! I now have my first superhet under my belt.

A word of caution in closing: This is a "hot chassis" design from earlier days ---and it means exactly what it says. Depending on which way it is plugged in,

the metal chassis CAN become electrically hot with respect to ground. Build it into an insulating cabinet, use plastic or Bakelite knobs, and do anything else you can to keep from exposing metal parts. Keep those tubes glowing!





PLUMB CRAZY
By Ken Ladd

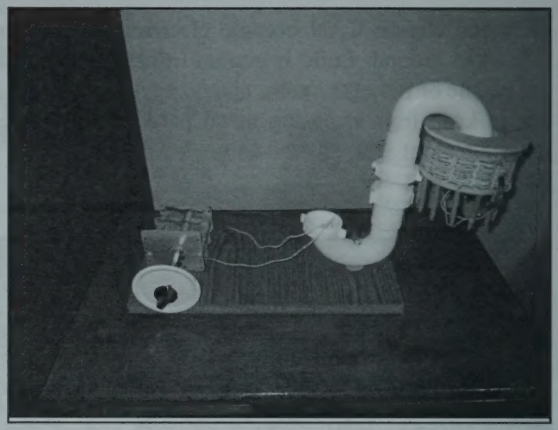
One day when I idly picked up two PVC P traps and held them together the thought came to me that they would make a great goose neck for adjusting the coupling between two radio coils. I decided to incorporate them in the trap coils on a version of Mike Tuggle's Lyonodyne radio. Mike helped me select Litz wire and advised me on the number of turns to use for my four inch coil forms. I have been interested in this radio since 1982 when it was published and I followed up with Mike. Larry Jeffer's provided me with two ceramic insulated variable capacitors one of which has silver plated plates.

I used fake wood grain shelves from a scrap bookshelf for the bases. I selected two variable capacitors from my collection that are about the same value to use with the trap coils. I adjusted the number of turns on one of the trap coils by connecting it to my antenna until it tuned the whole band of my local stations and left the other coil fully wound. I then discovered that my antenna was not connected to the lead in. After my son connected it for me I found that putting a standard variable capacitor in series with the antenna allowed me to peak the performance and even change stations. Mike uses a variable capacitor in the ground circuit much like Elmer Osterhoudt did on his MRL 2A.

I wound three different ferrite forms and selected the one that worked the best for the first tuned stage. I used automotive connectors on all the coils to make them easy to remove for tweaking. At some point I may wind them without forms like Mike did. I used the Xtal Set Society reduction drives on all four variable capacitors. I sprayed four Ball wide mouth caning lids with high gloss white paint and attached them to the drives with 2-56 screws. I faced them with clear deli plastic so that I can mark then with a fine point Sharpie and remove the markings with alcohol if needed. The trap coils will reduce or eliminate a troubling station. The coupling between the two stages can be varied by moving the ferrite coil.

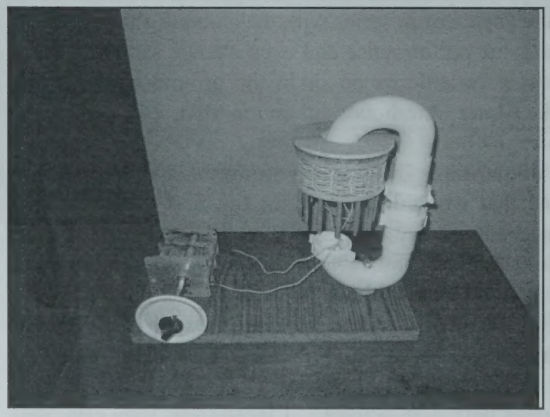
I took a small project box and fitted it with banana jacks and pin jacks to make a detector/headphone box.

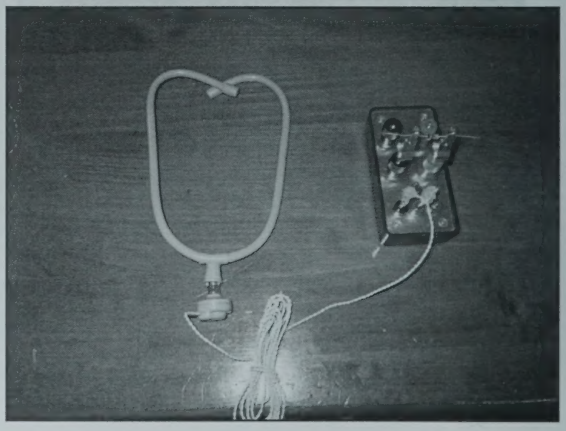
I used Grayhill test clips to make diode switching easy. I can switch back and forth from 47K ohms for a ceramic earphone and vintage German high impedance headphones that my friend Del gave me. I slipped the earpiece of the ceramic unit in to a toy stethoscope which works very well. I can switch back and forth between the primary and second stage to make tuning easier.



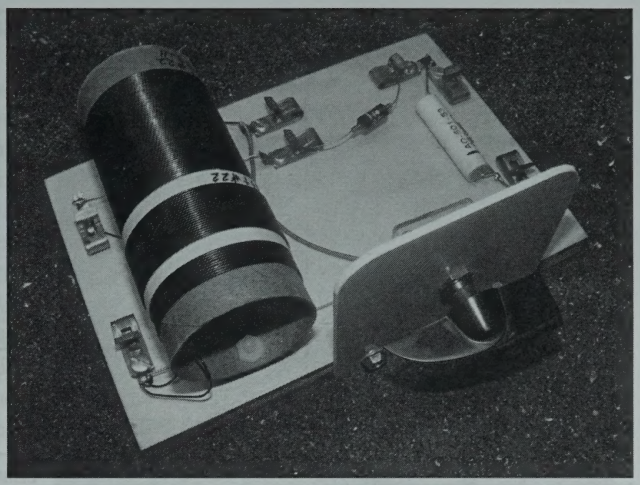
I purchased an ultrasonic cleaner from Harbor Freight and cleaned all of the variable capacitors with a solution of warm water and Dawn dish soap on the advice of an engineer from my previous job. It removed grime and dirty grease without harming the aluminum or silver.

I am currently using a fifty foot flattop antenna but I hope to erect Long Tall Sally in the near future. I built her using J. W. F. Puett's plans. She is eighteen feet tall and helically wound with seventy feet of wire. The plan indicates that she covers .55 to 15 MHz. This will definitely be a group project!!





The Last Crystal Set?
By Dan Petersen, W7OIL



There comes a time when there is the last of something – the last hurrah, the last of the Mohicans, an actor's last bow – the list could go on. I am titling this article "The Last Crystal Set" as it may very well be the last crystal set I build. No, I am not headed for the Big Radio Shack in the Sky (not yet, anyway) but I have come to the realization in looking around my radio room that I surely do not have a shortage of crystal sets. That also does not count the numerous other radio sets I have built over the years. As the end of the remarkable run of the Xtal Set Society's "*Newsletter*" draws near I felt a desire to go back to my roots and build a set that I would have built when I was a kid. And NO! I did not make my first set with stone tools…

When I was but a wee lad there were radio stores a plenty. WW2 was a not-so-distant memory and radio parts were plentiful. I remember Telrad electronics where loopsticks were 49 cents each (a week's allowance) and parts in bins up and down the aisles. Living in San Diego I remember war surplus stores on every corner – well maybe that's stretching it a bit but imagine a surplus store the size of a Safeway supermarket. Now imagine at least six to choose from. Making the arduous journey to Los Angeles (no Interstate highways then) was like going to surplus heaven. Kids nowadays have their noses buried in text messagers. WE had to *build* what we wanted. It was fun. My first crystal set was not as sophisticated as this one and I could pick up but one station. I think that was because I could *see* the transmitting tower from our back yard.

Where to begin with the "last crystal set"? It's as near as your local bathroom. The humble bathroom tissue core. Back in the day these paper tubes were stout enough to support a car. Today they can be pretty flimsy but still usable. I found the "Kirkland" brand from Costco is about as robust as they can get. For us kids the TP core was the support of choice for crystal radio tuning coils. Figure 1 shows the finished tuning coil. Both L1 and L2 are wound with #22 enameled wire. L1 consists of 110 turns of wire starting ½ inch in from the end of the tube. Two small holes were punched into the tube so that the wire end could be passed into then out of the core to anchor it. The wire is "closewound" meaning there is no spacing between turns. The tube may feel a bit flimsy when you start winding L1 but the assembly becomes surprisingly stout when finished. L2 is prepared as follows. I wound a piece of paper around the "cold" or ground end of L1. Then I anchored the wire end for L2 with a bit of tape. I then wound 23 turns of #22 enameled onto the paper and anchored the other end with more tape. I then varnished the whole thing to secure the windings. Two short standoffs hold the coil onto the wooden base.

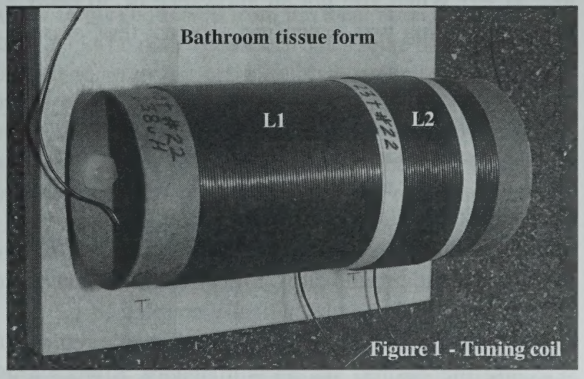


Figure 1 - Tuning coil

If I was trying to make the "ultimate" crystal radio" I would not mount the components directly to a wooden base. Wood, no matter how dry is not the best of insulators and if you live in a high humidity area can make your radio as deaf as Beethoven. The idea here is to make a radio that harkens to those past days.

The other parts, rare or common…

Germanium diodes were easy to get a hold of, as were galena crystals that you could pair with a safety pin to make a detector. Philmore had a fancy detector but it cost plenty – 89 cents as I recall. This radio uses either a germanium diode or it's modern descendant, the Schottky diode. A couple of good germanium diodes are the venerable 1N34 and the 1N69. For better sensitivity a modern FO215 Schottky diode works well. The diode is marked "D1" in the schematic. The dashed line from the cathode to the two connection points "A" and "B" show that the diode can go to either of those points. More on that later. The tuning capacitor I used is of 1950's to 1960's vintage, made in Japan, relatively common then but rare as swim fins for a buffalo now. I happened to have a couple in my stash so as to keep the spirit alive I used one of them. There is no reason why one of the Society's single-gang variables wouldn't work. The Society's type of variable cap was available back then but at extreme cost – something like $1.49! When you got an allowance of 50 *cents* a week everything was expensive – except the Saturday movies.

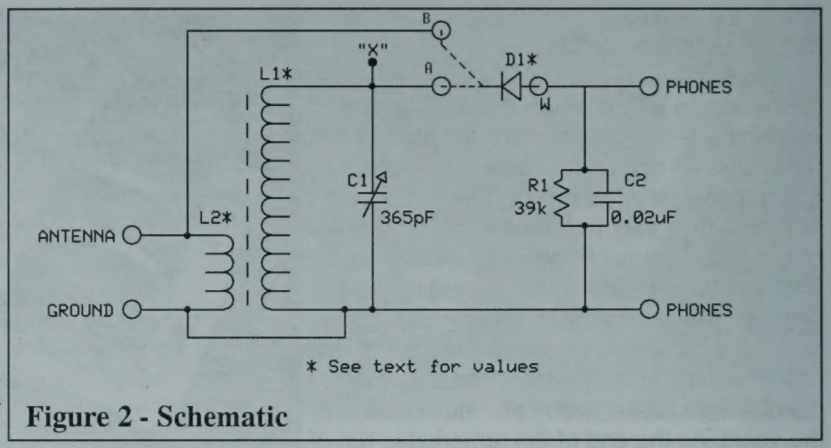


Figure 2 - Schematic

Figure 2 shows the set schematic in all its glory. All the connections shown are Fahnestock (FAWN-stock) clips and these are real brass "Fahnestock" brand. Fahnestock clips were a nickel apiece so they *were* within my budget. The wires from L2 are connected to the antenna and ground clips. Signals from the antenna pass through and are magnetically coupled to L2, the tuning inductor. L2 and C1 make the tuned circuit for selecting the desired station – in theory. Signals are detected by diode D1 and the resultant audio is fed to the headphones. Capacitor C2 filters out any remaining RF and R1 provides a DC path for the diode. R1 is important if crystal earphones are used. If there is no resistor the capacitor C2 and the crystal earphones, themselves acting like a capacitor will block the DC return and the audio will die out when the capacitors charge. If you use dynamic headphones R1 is not necessary but it won't hurt operations by being there either.

Figure 3 shows the layout of the set. No rocket science here! Construction is wide open. The tuning capacitor C1 is mounted on a piece of white plastic to form a rudimentary front panel. The diode connections bear a bit of explanation. D1's anode is connected to the top "Phone" connector. You could also connect the cathode end there but you must then turn your headphones left-to-right to understand the voices. Now about that bridge I'm selling… Actually it makes no difference which way the diode is connected! The other end, when connected to "A" will give you the best selectivity but the volume will not be as loud. If you have two flamethrowers close by this is the best choice. Connecting the diode to "B" will provide greater volume but selectivity suffers. So what is this point "X"? Point X is the same place as point "B" but if you connect the *antenna and the diode* there you will get the loudest sound but the tuning is all screwy. Why? Now you are connecting the antenna *directly* to the tuned circuit and in series/parallel with it. Since any antenna has it's own inductance and capacitance the two circuits connected together will mess up the tuning. In most cases you will hear the loudest flamethrower with a bunch of stations in the background. Here in VanWA I can pick up three stations. One is a crock-jock spewing verbal diarrhea, another is a Spanish language salsa music station and "Sunny 1550" who plays nostalgic music. Tony Bennett's "I left my heart in San Francisco" anyone? None will shred

my headphones but all are very clear. I could hook up an amplifier but that would be missing the point.

It was fun building this set, not only for an article but the nostalgia. I went through a lot of ups and downs with my various boyhood radios. I recall the best one I built was out of Morgan's "2nd Book of Radio and Electronics. That red tome started me off in a career in the electrical and electronic fields not to mention being a ham radio operator for 46 years now. I still own a copy of that book! Another of my favorites was an amplified crystal set using a 6C4 triode tube. I built that while visiting Allentown PA one summer. It was strange to me listening to all those stations with call letters starting with "W" rather than "K"!

Right now I have a set of "cans" (headphones) on and I am listening to a baseball game on 1550 AM with this set.
Nostalgia indeed…

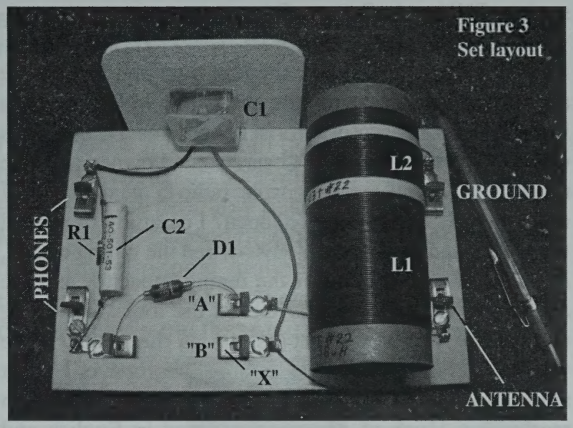


Figure 3
Set layout

The CBC On A Two-Transistor Radio
By
William H. Minardi

It was Christmas in 1965 and I was in the sixth grade. On Christmas day, one of the presents I received was an Archer-Kit 48-002 two-transistor radio kit from Radio Shack. This receiver was simple in design; and it only covered the standard broadcast (AM) band. It consisted of a simple parallel tuning circuit, a germanium diode detector and a two transistor audio amplifier. This was, however, more than enough audio output to drive an inexpensive crystal earphone. The radio's circuitry was mounted on a small square piece of perforated phenolic circuit-board. At this point in time, I learned how to solder. I used a Weller soldering gun that my Dad borrowed from Uncle George for one of his own projects. Over a period of time, my soldering skills improved; and I did a half-way decent job.

After some trial and error (more error than trial), I got the kit to work. Although it's performance did not rival a Rhode and Schwartz communications receiver (worth thousands of Bucks), it did manage to pick up a couple of local radio stations across town. I experimented with different types of antennas to improve the little radio's performance. I started out by using the dial-stop on the telephone in the front hall. It didn't work out very well. Then I extended the antenna out to a little over fifteen feet; and I hung it on a banister-reception improved.

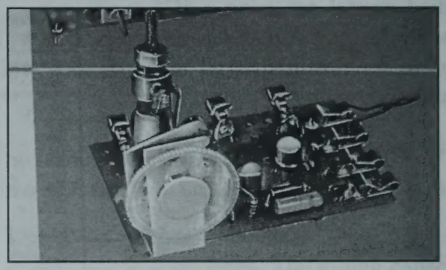
After a while, I lost interest in the little two-transistor radio and turned my attention to reading the Adventures of Tin Tin (a series of graphic novels written by Belgian author Herge) borrowed from the local library. I also read some books on radios and electronics some of which were difficult to wrap my pre-teen brain around. One of my uncles gave me a copy of Elements of Radio by Abraham and William Marcus. This book was used to train radiomen during World War Two. The first half of the book was easy to understand, however, the second half of the book was a little too heavy for an algebra-challenged youngster to comprehend. At any rate, reading those books fired up my interest in radios again.

For starters, I rebuilt the radio then erected a twenty-five foot long-wire antenna outside my bedroom window. I set it up by guying down the ends of the antenna where the ends of the rain gutters were attached to the roof of the house. I ran the wire over the top of my sister and my bedroom windows. The lead-in wire was tapped off one end of the antenna through the window and into my room. The lead-in wire added another six or seven feet to the length of the antenna. After I connected the antenna lead-in wire and ground connection, the nine-volt battery

and the crystal earphone; I began tuning the radio. No local radio signals. Nothing. I tuned the receiver again, only a little slower and picked up "buzz-saw" jamming signals, CW code, and the "beep-beep" of the time signal station, CHU, near Ottawa, CA.

I was listening to CHU for the first time and heard time announcements on the minute alternating in English then French. I was pleasantly surprised. I was receiving signals on short wave that I haven't heard since I owned a Philco model 41-280 all-wave console radio a year earlier. I asked myself, how did that happen? I carefully examined the wiring and discovered a miss-wired the tuning circuit. I connected the one end of the tuning capacitor and the antenna to the to the canter tap on the loopstick tuning coil. Hence, we had less turns and so the tuning range was higher. Because the radio tuned shortwave, I left it alone enjoyed the wiring error. Further tuning resulted in receiving a Voice of America broadcast in English and some Spanish speaking stations, too. However the best of them all was snagging the CBC's Radio Canada on Sunday morning while waiting for Mom and Dad to take my sister and me to church. I tuned into the strong signal and it was the tail end of the CBC news on the hour. Then another program began. It was Listener's Comer with host Earl Fisher.

This program was aimed at radio hobbyists from around the world who wrote letters to Mr. Fisher. The program was introduced by a staff announcer named Bob Cadman. The opening and closing theme to this program was the instrumental version of the song Nola. I remember one letter that Mr. Fisher read and it was from a listener in Australia. He wrote to say that he was listening to the program on a "fourteen-valve" (tube) shortwave receiver. I could not recall the brand or the radio, however. I made it a point to listen to Listener's Comer every Sunday morning before church. Of course, I listened to other stations as the Voice of America special English broadcasts and my old friend, the Armed Forces Radio and Television services and CHU time signals. A year later, I graduated to a Stewart-Warner model 1801. Today, I use the receiving section of a Yaesu FT101EX and an rCOM rC-R75 communications receiver. And that is one of my earliest memories of my getting started in the radio hobby.



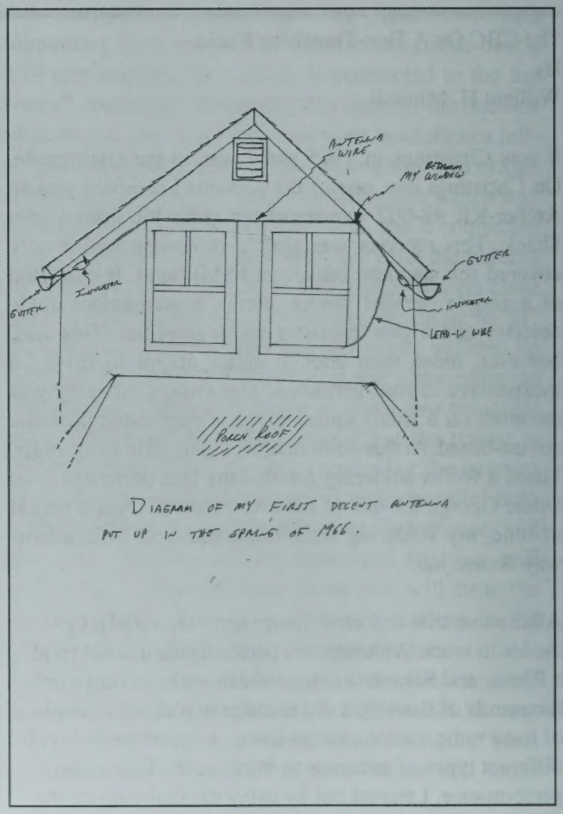


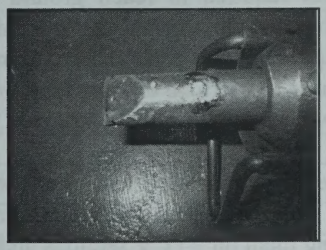
Diagram of my first decent antenna put up in the spring of 1966.

Xtal Corner: Member Correspondence

Patricia it was nice speaking with you this afternoon and ordering the remaining newsletters. I was thinking I wanted to order the INFINITE IMPEDANCE DETECTOR KIT and then I saw the JFET DETECTOR KIT. Uh they seem like they do the same thing. So, I was wondering what would be better to get to just play around with tank circuits with different coils and capacitors. It appears that the INFINITE IMPEDANCE DETECTOR KIT is passive and does not require a battery. The JFET DETECTOR KIT seems to also offer a very high impedance to a tank circuit as well, but requires a battery. What is the difference between these two devices? Millard C Smith (Brooke)

Hi Brooke. Both the JFET detector and the INFINITE IMPEDANCE detector require a battery. The only difference between them is that extra parts are added so that the infinite impedance detector provides better audio sound. Some don't care about that. Saying it another way, the tone/ signal received is more pleasing to those that like good audio. Phil

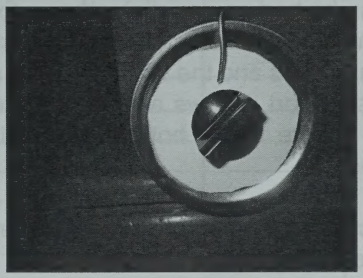
From Ken Ladd
I drilled cavity into the 1/2 inch copper tip of my 200 watt soldering iron tip to serve as a solder pot to tin fluxed litz wire etc. I thought that I was pretty clever until I remembered seeing it in an old magazine.



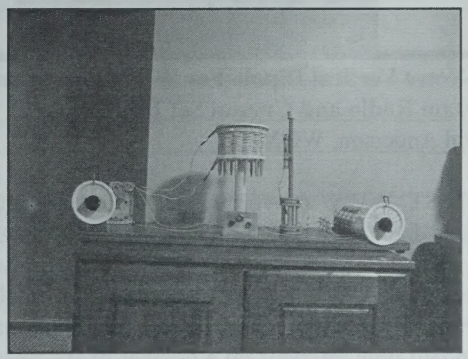
Also, Some of the reduction units that I just received have a very sticky substance on them. I was going to try to clean them with iso-alcohol but thought I would check with you first.

Hi Ken
Sometimes they come that way. Try just a drop of oil on just one of them first to see how that works. Alternatively, add a pointer knob and turn it back and forth a number of times to loosen the stickiness. GOOD LUCK Phil

Ken Ladd
I mounted a wide mouth quart jar lid to the reduction drive with 2-56 screws. I do not like my paper insert so I will probably paint it white. I am building Mile Tuggles Lyonodine and wanted something to mark my strongest stations with. I will probably use an ultra fine sharpie pen. The wire pointer is crude but it is my first attempt.



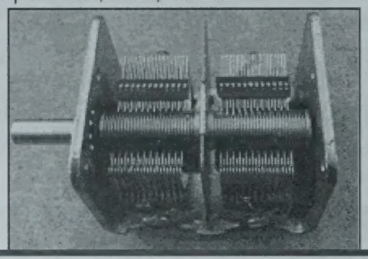
The radio has four tank circuits and four different variable capacitors. I made shaft couplers using two different size bolt extenders. I will have to make adjustments for shaft heights that are out of the range of the standard bracket. It could get interesting. I ended up with three types of Litz wire. I decided to use my coil forms. I have yet to wind the ferrite center coil for the first circuit. I have some unknown rods here but may up using one of yours.



Good morning,
I am interested in your double 365 air capacitor. Will the L bracket or the RD bracket work with this capacitor to attach it to the bottom? Which one should I order?
Could you please send the approximate measurements of this capacitor to see if it fits into the rig I am building? Thanks your time. 73, and Kind regards KM4MAV, Jaime Mayoral

Hello Jaime,
The L and RD brackets were designed to work with your single capacitors; they do not line up with the dual-gang.
You'll notice in the picture of the dual gang that the shaft is off-center so that close to linear tuning can be had as you dial, given a fixed coil.
The dual—band is taller and wider than the single-gang caps and the shaft is higher above the chassis. Short Screws are used – through a chassis to secure to the bottom of the dual-gang to the chassis.

As such the L and RD brackets are not used with the dual-gang.
dual gang
L- 2.18 inches
W- 1.810 inches
H- 1.63 inches
hope that helps. 73, Phil, W0XI



Half-Wave Vertical Dipole For WWV Reception and Ham Radio and Crystal Set Use
By Phil Anderson, WØXI

The NIST WWV (government) station broadcasts time and frequency info 24 hours per day, 7 days per week and can be heard by many listeners worldwide. Radio station WWV is located north of Fort Collins, Colorado. Broadcasts consist of time announcements at standard time intervals on a number of HF frequencies, along with some time updates/corrections. Many amateurs use the accurate time broadcasts to align their computer clocks prior to operating some of the so-called digital modes, such as PSK-31.

WWV operates on a number of HF frequencies including 5, 10 and 15 MHz at 10,000 watts; and 2.5 and 20 MHz at 2500 watts. Each frequency is broadcast from a separate transmitter and antenna. The antennas used are half-wave vertical antennas that radiate omnidirectional patterns. Each antenna is connected to a dedicated transmitter for a given frequency. Each antenna is mounted on a tower that is approximately one half-wavelength tall. The top section of each antenna is an additional quarter-wavelength radiating element. The bottom half of each antenna consists of nine quarter-wavelength wires that connect to the top of the tower and slope downwards toward ground at a 45 degree angle. This sloping skirt functions as the lower half of the radiating system and also guys the antenna.

In reviewing this arrangement, it occurred to us that the elevation of the antenna compared to the typical quarter-wave vertical above ground should improve reception for distant receiving antennas. In addition, such an antenna could also be utilized as the transmitter antenna for a typical amateur radio station. My intention, in the coming months, is to erect such an antenna for 20-meters. This could be easily constructed with PVC pipe in three sections of 16.4 feet. The upper half the guy wires holding up the antenna would provide the "skirt" or bottom half of the vertical dipole. The remaining non-conductive skirt would finish the guy ropes/wires required to reach ground to secure the tower. Coax for the antenna feed would run from the station, up the inside of the antenna skirt and attach to the center of the vertical dipole at the top of the tower section, which would be about 32.8 feet.

Of course, if that arrangement seems a bit much for you, one could shorten each of the nine "skirt" wires by winding them on 9 PCV sections and also reducing the main radiator by the same manner. Then the total height of the vertical dipole would be just 24.6 feet – just 3 sections of PCB pipe. Of course each radial in the skirt would have to have its own PVC form. My choice would be to keep to the original plan, resulting in a total height for the 20-meter antenna at 49.2 feet.

Call: 405-517-7347 Xtal Set Society www.midnightscience.com
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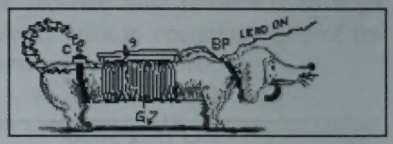


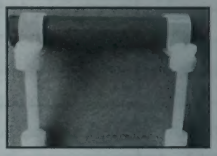
6-29-17

We are dedicated to once again building and experimenting with radio electronics, often—but not always—through the use of the crystal set, the basis for most modern day radio apparatus. This newsletter helps support our goal of producing excellent quality technical books that encourage learning and building.

Please send articles and correspondence to the following address:

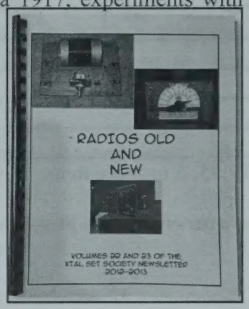
PO Box 3636, Lawrence KS 66046

Nylon Form for Rod

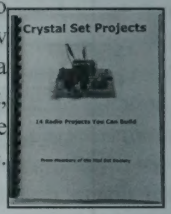


This set of nylon parts combine as a form for the ferrite rod, thus preserving the Q of the rod mounted above a chassis. The Rod is not included. Nylon Form rod $2.50

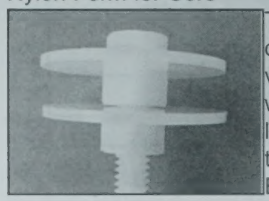
RADIOS OLD AND NEW is volumes 22 and 23 of the Xtal Set Society Newsletter. A wide range of topics and projects are covered in 2012: aerials circa 1917, experiments with regens, grounding and reducing noise in your station, experimenting with spider coils, a 2 for 1 regen set, primer for the 602 mixer at 40 kHz, a modern TRF AM receiver. The following topics for 2013 are: JFET Drain-Output set, a foxhole radio, feedback for beginners, a modern day regen, the universal crystal set, The Albert Hull Memorial Dynatron Regenerative Receiver, adding absorption wave traps, from telegrapher to coherer, a 700 Hz oscillator featuring a quadrature architecture, and more. Vol 23 $15.95



Crystal Set Projects You Can Build is a collection of 14 radio projects designed by members of the Xtal Set Society. The members hope that by creating this book they will help others to discover this great hobby while at the same time learning basic radio concepts. Here's a sampling: Low Budget Xtal Set, A Loop Antenna Crystal Set, The Den Two Crystal Set, Build a Matchbox Crystal Radio, The triple Tuned Crystal Set and more. XCP $12.95



Nylon Form for Core



These nylon plastic pieces combine as a form for the various ferrite toroid coils we offer. The form is low loss thus preserving the Q of the coil wound on the form. Extending them above the chassis - which might be metal or fiber board also preserves the coil Q. nycore-frm $2.50

R-L-C-D Assortment

This assortment has nearly all the parts to build a basic am crystal set: 100 pf cap, 330 pf cap, am-band toroidal coil form (ft-82-61), 47k and 100k resistors and a 1n34 diode. RLCD 5.95

Spider Coil Form

This 5 by 6 by 1/8th inch ABS plastic form includes nine NC punched radial slots and five mounting holes. This size supports 250 uH coils when used with #22 or #26 enamel, or 150/45 Litz wire found on our website. The coil shown consists of 56 turns of 150/45 Litz, with a 1.6 inner diameter and 4.2 outer diameter. An instruction sheet including formula and table ships with the form. In addition, you'll find the spider formulas for number of turns for a given inductance on our formulas-calculators web page on our main site, www.midnightscience.com Spider Coil Form Cat #SpCO $9.95 each.